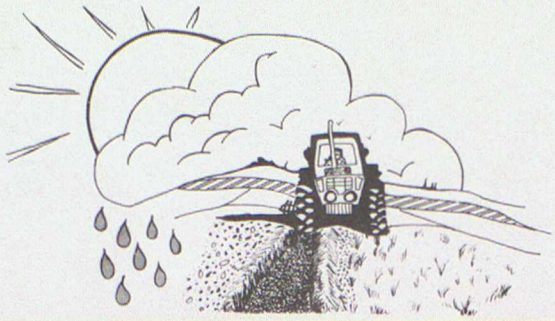
AGRO-METEOROLOGY DEPARTMENT - Eastern Region



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This paper, by E. Spackman, RAMO Cambridge, presents estimates of the number of spray-occasions during the 1984/85 season.

The estimates are calculated from standard meteorological observations using criteria designed to be appropriate for 'residual' and 'hormone' types of herbicide, and 'Conventional' and 'Low Ground Pressure' types of spraying vehicle. The estimates are compared with the average for the period 1970 to 1983.

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AGRICULTURAL MEMORANDUM No 1063

SPRAY-OCCASIONS: JULY 1984 to JUNE 1985

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Summary. This paper presents estimates of the number of spray-occasions during the 1984/5 season. The estimates are calculated from standard meteorological observations using criteria designed to be appropriate for "residual" and "hormone" types of herbicide, and "Convential" and "Low Ground Pressure" types of spraying vehicle. The estimates are compared with averages for 1970 to 1983.

1. Introduction

Weather conditions which affect spraying have been discussed by Spackman (1983) whilst "spray-occasion" analyses have been presented at each BCPC Herbicide Review since 1979. The method of analysis, criteria adopted and stations used are similar to those presented at the BCPC Review of Herbicide Usage 1984 - see Spackman (1984).

2. Analysis

a) Criteria. The criteria used to identify occasions suitable for spraying four different types of chemicals are reproduced in Table 1. It has been noted previously that there are usually only small differences between the number of spray-occasions with "contact", "contact-hormone" and "hormone" criteria so only results for "residual" and "hormone" types have been analysed.

b) Stations. This year meteorological data have been used from six stations:

Kinloss, Grampian - about 50km east north east of Inverness
Aldergrove, Northern Ireland - about 20km west of Belfast
Leeming, Yorkshire - about 55km north of Leeds
Waddington, Lincolnshire - about 10km south of Lincoln
Boscombe Down, Wiltshire - about 40km north west of Southampton
Mount Batten, Devon - just south of Plymouth

These stations are taken to identify the broad-scale variation in the number of spray-occasions in arable areas across the United Kingdom. More specific results may be required for some purposes or for locations unlikely to be represented by the above stations. Such analyses may be obtained from the Agricultural Meteorology Departments based at the MAFF/ADAS Regional Offices or from the Agricultural Meteorology Department of the Meteorological Office at Bracknell, Berkshire.

3. Results

The number of spray-occasions each month are given in Table 2. Table 3 gives differences from average for each month and, in order to make it easier to assess the main features of the year, those months with five or less spray-occasions are shown in **bold** type.

a) Conventional vehicles

Summer 1984. In June spray-occasions were a little above average except in Scotland - the values were given in Herbicide Review 1984 (Spackman, 1984). In July and August they were well above average in most areas.

Autumn 1984. Spray-occasions were below normal throughout the period. This meant that there were few occasions in October and none in November.

Winter 1984/5. December and January had, as normal, no spray-occasions. February, unusually, had quite a few, except in Northern Ireland. For "residual" chemicals there were over 10 occasions at Waddington and Mount Batten.

Spring 1985. In March and April the number of spray-occasions were down compared with normal; this meant that there were only a few occasions in March - but this is not very unusual. In May, there were a respectable number of spray-occasions although they were below normal at Leeming and Waddington. In June, values tended to be above normal in the north and below normal in the south.

b) Low Ground Pressure vehicles

The main feature of the year is that the number of spray-occasions were well down from November to January; in fact there were no occasions in November and December, which is very unusual, and only a very few in January.

Table 4 shows the number of extra spray-occasions on which Low Ground Pressure vehicles could be used when Conventional vehicles could not be used (ie ground conditions were limiting for Conventional vehicles). Months with five or fewer spray-occasions are also shown and identify periods in which Low Ground Pressure vehicles may have been of particular value.

A substantial number of extra spray-occasions for Low Ground Pressure vehicles occured in Autumn and Spring - this is particularly notable for "residual" type chemicals in October and March. The wet conditions this year meant that even in June some extra occasions are estimated to have been available at Kinloss, Waddington and Mount Batten.

For "hormone" type chemicals, the extra number of spray-occasions were relatively larger in Autumn than in Spring. In Autumn the extra occasions were mainly at the northern stations. Again, these extra occasions should have been particularly useful in October (for any "hormone" type spraying that could have been done then).

Table 5 is a summary of the number of spray-occasions in a more detailed form - namely in 10-day periods. This shows for Conventional vehicles that, except for mid-October and late February, there were very few spray-occasions after mid-September until mid-April. For Low Ground Pressure vehicles there were no spray-occasions at most stations from late October until early February. Also, for "hormone" type chemicals, if advantage could not be taken of the minimal "spray-window" in late February and early March, then there were no occasions until mid-April.

4. Conclusion

Spray-occasions were mostly above average during Summer 1984 and below average in the Autumn. There were no occasions in November and December and only a very few (for Low Ground Pressure vehicles and "residual" type chemicals) in January. There were some spray-occasions in February. Numbers were below normal in April and, at Leeming and Waddington, continued to be below normal in May.

Of particular note for "residual" type chemicals, are the low number of occasions during November and December for Low Ground Pressure vehicles and the extra spray-occasions, at three of the four stations in England, during February for Coventional vehicles.

For Conventional vehicles, 1984/5 would appear to have been a year in which the opportunities for spraying were very poor from October to January and less good than normal in April. Low Ground Pressure vehicles should have been of particular value in October and March for "residual" type chemicals but may not have offered more than a few opportunities for spraying from November to January.

Acknowledgement

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References

Spackman, E.A. (1983) Weather and the variation in numbers of spraying-occasions.
AAB Aspects of Applied Biology 4, 1983

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Agricultural Memorandum No 1043
also available in
BCPC, 21st Review of Herbicide Usage 1984

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Table 1. Spray-occasion criteria

Constraint	Conditions	Chemical Type* R	C	CH	H
Operations	Daylight - but between 06 GMT and 20 GMT				
	Temperature > 1 deg C				
	No standing water, glaze, frozen ground or snow lying at 12 GMT				
	Visibility > 100 metres				
	Spray period - 5 consecutive hours				
Sprayer	Wind speed >= 2 knots (about 1 ms^{-1}) and wind speed <= 9 knots (about 5 ms^{-1}) (wind speeds measured at 10 metres above ground)				
Vehicle	For Conventional vehicles the Soil Moisture Deficit (using a bare soil model) must exceed 5 mm				
Chemical					
- Temperature	> 1 deg C next night		o	o	o
	Day maximum >= 10 deg C				o
- Relative Humidity	> 80% if temperature < 10 deg C		o		
	< 95%			o	o
- Rain	< 1.0 mm in any hour	o			
	< 0.1 mm in any hour		o	o	o
	< 0.1 mm in each of 3 hours after spraying		o	o	o
	< 2.0 mm total in 9 hours commencing 3 hours before spraying		o	o	o

Notes:

* Chemical types: R - Residual; C - Contact; CH - Contact-hormone; H - Hormone

"o" indicates that the specified criteria must be satisfied

Table 2. Spray-occasions 1984/5 (monthly values)

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Conventional vehicles												
Residual												
Kinloss	32	44	10	0	0	0	0	7	5	8	27	25
Aldergrove	26	34	7	0	0	0	0	0	1	14	31	31
Leeming	31	38	20	2	0	0	0	7	7	8	12	31
Waddington	44	36	17	5	0	0	0	11	0	10	13	17
Boscombe Down	28	31	11	4	0	0	0	3	4	11	27	22
Mount Batten	38	29	9	5	0	0	0	13	2	11	20	19
Hormone												
Kinloss	28	38	10	0	0	0	0	4	1	2	14	20
Aldergrove	22	32	5	0	0	0	0	0	0	6	20	25
Leeming	28	34	12	1	0	0	0	1	2	6	11	27
Waddington	42	30	16	5	0	0	0	2	0	5	6	15
Boscombe Down	26	25	9	4	0	0	0	1	1	8	20	16
Mount Batten	36	28	9	4	0	0	0	4	0	9	18	16
Low Ground Pressure vehicles												
Residual												
Kinloss	32	44	28	16	0	0	7	8	12	20	27	31
Aldergrove	27	37	22	14	0	0	3	8	15	20	31	31
Leeming	31	38	24	15	0	0	0	13	14	10	18	31
Waddington	44	45	25	17	0	0	1	14	14	14	17	25
Boscombe Down	28	31	14	14	0	0	3	6	10	13	27	22
Mount Batten	38	34	13	13	0	0	1	17	11	14	20	21
Hormone												
Kinloss	28	38	21	9	0	0	0	4	1	5	14	24
Aldergrove	23	35	15	9	0	0	0	3	1	8	20	25
Leeming	28	34	13	8	0	0	0	1	2	6	15	27
Waddington	42	34	21	16	0	0	0	2	0	7	8	19
Boscombe Down	26	25	9	8	0	0	0	2	3	8	20	16
Mount Batten	36	31	12	8	0	0	0	5	2	11	18	18

Table 3. Spray-occasions 1984/5
- difference from average (Jan 1970 to May 1983)

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Conventional vehicles												
Residual												
Kinloss	+7	+17	-4	**-7**	**-1**	**0**	**0**	+5	**-2**	-8	+5	+1
Aldergrove	0	+7	-5	**-3**	**0**	**0**	**0**	**0**	**-3**	-3	+10	+8
Leeming	+2	+11	0	**-7**	**-1**	**0**	**0**	+7	+3	-7	-9	+5
Waddington	+15	+9	-3	**-4**	**-1**	**0**	**0**	+11	**-4**	-5	-8	-9
Boscombe Down	+1	+3	-6	**-3**	**-2**	**0**	**0**	**+3**	**0**	-2	+8	-3
Mount Batten	+13	+3	-6	**-2**	**-1**	**0**	**0**	+12	**-3**	-4	+1	-4
Hormone												
Kinloss	+9	+17	-2	**-5**	**0**	**0**	**0**	**+3**	**0**	**-6**	-1	+2
Aldergrove	0	+9	**-5**	**-2**	**0**	**0**	**0**	**0**	**-1**	-5	+4	+5
Leeming	-3	+13	-5	**-5**	**0**	**0**	**0**	**+1**	**0**	-2	-5	+5
Waddington	+17	+9	-1	**-1**	**0**	**0**	**0**	**+2**	**-2**	**-3**	-10	-7
Boscombe Down	+2	+1	-5	**0**	**0**	**0**	**0**	**+1**	**-1**	0	+5	-6
Mount Batten	+15	+5	-5	**-2**	**-1**	**0**	**0**	**+4**	**-3**	-2	+3	-3
Low Ground Pressure vehicles												
Residual												
Kinloss	+6	+14	+10	+3	**-7**	**-5**	+2	-1	-1	+1	+4	+6
Aldergrove	-2	+5	+3	-2	**-7**	**-7**	**-3**	-2	+2	-3	+6	+5
Leeming	0	+7	+1	-2	**-8**	**-5**	**-5**	+4	+1	-10	-6	+4
Waddington	+13	+14	+2	0	**-8**	**-5**	**-4**	+5	+1	-6	-7	-2
Boscombe Down	0	+1	-6	0	**-9**	**-6**	**-3**	-2	-1	-3	+7	-4
Mount Batten	+12	+6	-8	-2	**-8**	**-7**	**-6**	+7	-1	-4	0	-2
Hormone												
Kinloss	+8	+15	+7	+2	**-1**	**0**	**0**	**+3**	**-1**	**-3**	-1	+5
Aldergrove	-1	+9	+1	-1	**-1**	**0**	**0**	**+2**	**-2**	-6	+2	+3
Leeming	+2	+10	-5	-1	**-1**	**0**	**0**	**+1**	**-2**	-4	-3	+4
Waddington	+16	+10	+3	+7	**-1**	**0**	**0**	**+2**	**-4**	-3	-10	-4
Boscombe Down	+2	0	-6	0	**-1**	**0**	**-1**	**+1**	**0**	-1	+4	-7
Mount Batten	+14	+7	-5	-2	**-3**	**-1**	**-1**	**+4**	**-3**	-2	+1	-1

Note: values in **bold** type show months with 5 or fewer spray-occasions

Table 4. Spray-occasions 1984/5
- extra occasions for Low Ground Pressure vehicles

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Residual												
Kinloss	0	0	18	**16**	**0**	**0**	**7**	1	**7**	12	0	6
Aldergrove	1	3	15	**14**	**0**	**0**	**3**	**8**	**14**	6	0	0
Leeming	0	0	4	**13**	**0**	**0**	**0**	6	7	2	6	0
Waddington	0	9	8	**12**	**0**	**0**	**1**	3	**14**	4	4	8
Boscombe Down	0	0	3	**10**	**0**	**0**	**3**	**3**	**6**	2	0	0
Mount Batten	0	5	4	**8**	**0**	**0**	**1**	4	**9**	3	0	2
Hormone												
Kinloss	0	0	11	**9**	**0**	**0**	**0**	**0**	**0**	**3**	0	4
Aldergrove	1	3	**10**	**9**	**0**	**0**	**0**	**3**	**1**	**2**	0	0
Leeming	0	0	1	**7**	**0**	**0**	**0**	**0**	**0**	0	4	0
Waddington	0	4	5	**11**	**0**	**0**	**0**	**0**	**0**	**2**	2	4
Boscombe Down	0	0	0	**4**	**0**	**0**	**0**	**1**	**2**	0	0	0
Mount Batten	0	3	3	**4**	**0**	**0**	**0**	**1**	**2**	2	0	2

Note: values in **bold** type show months with 5 or fewer spray-occasions for Conventional vehicles.

Table 5. Spray-occasions 1984/5 (10-day values)

	Residual						Hormone					
	KIN	ALD	LEE	WAD	BOS	MB	KIN	ALD	LEE	WAD	BOS	MB
Conventional vehicles												
1-10 Sep	8	5	7	8	7	6	8	4	5	8	7	6
11-21	2	2	12	9	4	3	2	1	7	8	2	3
21-30	0	0	1	0	0	0	0	0	0	0	0	0
1-10 Oct	0	0	0	0	0	0	0	0	0	0	0	0
11-20	0	0	2	4	4	5	0	0	1	4	4	4
21-30	0	0	0	1	0	0	0	0	0	1	0	0
1 Nov - 31 Jan	0	0	0	0	0	0	0	0	0	0	0	0
1-10 Feb	0	0	0	0	0	0	0	0	0	0	0	0
11-20	1	0	0	3	0	3	0	0	0	0	0	0
21-28	6	0	7	8	3	10	4	0	1	2	1	4
1-10 Mar	4	0	4	0	1	1	1	0	1	0	1	0
11-20	0	0	3	0	3	1	0	0	1	0	0	0
21-31	1	1	0	0	0	0	0	0	0	0	0	0
1-10 Apr	0	2	0	0	0	0	0	0	0	0	0	0
11-20	0	2	4	6	7	7	0	2	4	5	6	7
21-30	8	10	4	4	4	4	2	4	2	0	2	2
1-10 May	10	10	4	4	6	5	6	3	3	0	6	4
11-20	6	10	2	3	11	10	3	9	2	3	8	9
21-31	11	11	6	6	10	5	5	8	6	3	6	5
1-10 Jun	14	12	13	1	7	6	11	11	11	1	3	4
11-20	6	10	14	12	12	11	4	10	14	11	12	10
21-30	5	9	4	4	3	2	5	4	2	3	1	2
Low Ground Pressure vehicles												
1-10 Sep	8	9	7	8	7	6	8	7	5	8	7	6
11-21	11	8	12	10	4	3	7	4	7	8	2	3
21-30	9	5	5	7	3	4	6	4	1	5	0	3
1-10 Oct	5	7	3	8	6	4	3	6	1	7	3	3
11-20	7	7	9	6	6	7	5	3	5	6	5	5
21-30	4	0	3	3	2	2	1	0	2	3	0	0
1 Nov - 31 Jan	7	3	0	1	3	1	0	0	0	0	0	0
1-10 Feb	1	3	4	3	3	4	0	1	0	0	1	1
11-20	1	1	2	3	0	3	0	0	0	0	0	0
21-28	6	4	7	8	3	10	4	2	1	2	1	4
1-10 Mar	4	5	4	5	5	6	1	1	1	0	3	2
11-20	0	3	4	4	3	2	0	0	1	0	0	0
21-31	8	7	6	5	2	3	0	0	0	0	0	0
1-10 Apr	5	7	2	2	1	1	2	2	0	0	0	1
11-20	7	3	4	8	8	9	1	2	4	7	6	8
21-30	8	10	4	4	4	4	2	4	2	0	2	2
1-10 May	10	10	4	4	6	5	6	3	3	0	6	4
11-20	6	10	6	5	11	10	3	9	5	4	8	9
21-31	11	11	8	8	10	5	5	8	7	4	6	5
1-10 Jun	14	12	13	5	7	6	11	11	11	4	3	4
11-20	9	10	14	15	12	11	6	10	14	12	12	10
21-30	8	9	4	5	3	4	7	4	2	3	1	4

Key to stations: KIN - Kinloss WAD - Waddington ALD - Aldergrove
BOS - Boscombe Down LEE - Leeming MB - Mount Batten